

ANNUAL REPORT

A View Inside Our Organization

January 2000



NASA Goddard Space Flight Center
Applied Engineering and Technology Directorate
Information Systems Center - Code 500



Contents

Preface.....	1
ISC Mission Statement.....	2
Strategy Objectives.....	2
Accomplishments for 1999.....	3
Technology Program and Portfolio.....	4
Branch Organization	9
System Integration and Engineering (Code 581).....	10
Flight Software (Code 582).....	11
Mission Applications (Code 583)	12
Real-Time Software Engineering (Code 584).....	13
Computing Environments and Technology (Code 585)	14
Science Data Systems (Code 586).....	15
Science Data Systems (Code 587).....	16
Advanced Architectures and Automation (Code 588).....	17
Laboratories and Facilities.....	18
Personnel Awards and Recognition's	19
Publications	20
Contractor Partners.....	21
Collaborations.....	22
Management Point-of-Contacts.....	32
Products/Services - Point-of-Contacts	33
Acronyms and Abbreviations.....	34

Preface

It has been two years since the Goddard Space Flight Center (GSFC) reorganization and the establishment of the Information Systems Center (ISC) within the Applied Engineering and Technology Directorate (AETD).

It has been a busy, and at times, somewhat chaotic two years, as we've worked to implement a new organization - while still fulfilling our project and functional obligations. This period has been a highly successful one for ISC. Not only have we launched a new organization and established an exciting course to the future, we have also contributed substantially over a broad range of GSFC missions and technologies.

With our formative years behind us, I see "YR 2K" as one of building on what is currently working well and aggressively fixing areas that need improvement. For example, improving communication and dissemination of information down, up, and across ISC is a target objective.

This report provides some highlights from 1999, the ISC branch structure, summary of awards, technical papers, key academic collaborators, support contractors and some key points of contact within ISC. It is intended to give the reader an insider's view of the organization.

I'm looking forward to working with ISC employees and customers in the new century. The upcoming GSFC missions are exciting with many project management and engineering challenges. ISC is made up of exceptionally committed and talented professionals, and the ISC Management Team will be looking for more opportunities this year to listen to your ideas, concerns and recommendations about better ways of achieving our customer's needs and mission goals.

But no need to wait for an occasion! Got an idea? Suggestion? Contact any of us on the ISC Management Team and share your thoughts. We'd love it!

For more information, check out our website: <http://isc.gsfc.nasa.gov>

Marti Szczur
Chief, Information Systems Center

ISC Mission Statement

To provide high value information systems products, services, and expertise, and to advance information technologies, which are aligned with customer needs.

The ISC is an innovative center of expertise in the formulation and implementation of information systems in support of National Aeronautical and Space Administration (NASA) programs and projects, specifically the GSFC Earth Sciences, Space Sciences, and Technology focus area. The ISC collaborates with the science community and other customers to meet their information systems and technology needs through the design, implementation, and integration of information systems and data system components. The ISC provides technology, capability and products in design, development, implementation, test, integration and operations. Additionally, the ISC provides leadership and vision in identifying and sponsoring new and emerging information systems technologies.

Strategy Objectives

The ISC has five primary strategy objectives:

- Deliver high value products and services that satisfy customer needs.
- Advance leading edge information systems technology.
- Build a diverse, talented, innovative, energized, internationally recognized workforce of employees and managers.
- Establish open, flexible, collaborative relationships with customers and partners.
- Build a cohesive, 'no walls' organization with effective inter and intra branch communication and collaboration.

Accomplishments for 1999

This period has been a highly successful one for GSFC, and ISCers have contributed to many significant mission accomplishments. For example, a few highlights include:

- Successful software system delivery, launch support, in-orbit checkout & mission operation of HST Servicing Mission 3, Terra, TRACE, SWAS, Spartan 201, Landsat-7, QuikSCAT, and more than 20 sounding rockets at Wallops.
- Successful completion and on-orbit performance of the entirely new flight software for a 486-flight computer installed during HST Servicing Mission-3A.
- Successful development and delivery of the advanced Vision 2000 Control Center System in support of HST's continued operations into 2010.
- Successful recovery of the WIRE spacecraft from an early on-orbit hardware anomaly. Leadership in plans to use WIRE as a technology testbed.
- Mission operations engineering for more than 14 on-orbit missions. Key players in the recovery of SOHO and recovery from anomalies on ERBS, HST, CGRO, XTE and others.
- Technical management and system engineering of the EOS Data Information System (EOSDIS) with a successful system delivery supporting LANDSAT and Terra data collection, processing, archival and distribution.
- Software deliveries for missions under development, including Terra, MAP, Triana, GLAS, SIRTf IRAC, Astro-E XRS, EO-1 WARP and HST new instruments.
- Leadership role in strategizing innovative solutions to NGST end-to-end flight software systems.
- Lead roles in real-time ground systems for more than 8 early phase and/or under development missions including PM, Chem, MAP, IMAGE, EO-1, Triana, ADEOS II, and ULDB).
- Successful flight software sustaining engineering of 11 on-orbit mission systems including HST SSM, HST Payload, CGRO, EUVE, SAMPEX, XTE, FAST, TRMM, SWAS, TRACE, WIRE.
- System designers/builders of the collaborative and distributed Integrated Mission Design Center (IMDC), which enabled a record number of pre-Phase A proposals to be generated in record time.
- Hosts of the internationally attended Annual NASA/GSFC Software Engineering Workshop.
- Successful proof-of-concept technology demonstrations and/or infusions of next generation information systems into missions (e.g., Standard Autonomous File Server (QuikSCAT, EO-1), GenSAA/GENIE - an expert system builder/runtime tool for automating S/C command and control functions (GRO, XTE, NOAA K, TRMM, ACE), Instrument Remote Control System (HAWC, EAGAL, SAFIRE, SPIRE), Scientist Expert Assistant (NGST, HST), Spacecraft Emergency Response System (SMEX, MIDEX, EO1), Onboard Adaptive Scheduling (NGST), JAVA-based S/C Interface to Telemetry and Command Handling, Visual Analysis Graphical Environment, software for the advanced, high-rate Return Link Processor Card (EO1), advanced intelligent architecture for Lights-out Mission Operations).

Accomplishments for 1999 (Cont'd)

- Recipients of two NASA Software awards with substantial monetary awards from the NASA Inventions and Contributions Board: GENIE - an expert system builder/runtime tool for automating S/C command and control functions; and ITOS (Integrated Test and Operations System) - a real-time control and monitoring system developed for control of spacecraft and spacecraft components during development, test, and on-orbit operations.
- Active participation in GSFC's earth and space science technology roadmap building activities.
- Authored over 40 technical papers and journal articles, presenting at premier conference across the globe.
- Key supporting roles for science information systems (e.g., CCSDS, NSSDC, Digital Earth, NCCS, HPCC, ISTEP).
- Numerous other key roles associated with design, assembly, management, assessment, consultation of information systems enabling the NASA and GSFC missions (e.g., YR2K activities, NCC 98, OMNI, IFMP, SOMO, CSOC, NCC, MARS, WWW technologies including the ISC web pages, GSFC security/network infrastructure, and ISO certification).

Technology Program and Portfolio

The ISC Technology Program is aligned to the strategic direction of the NASA and GSFC technology programs to develop critical technologies that enable innovative, less expensive, missions. The ISC efforts target both short- and medium-term technology development and infusion activities, in addition too long-term high risk, high-pay-off technology research and development initiatives.

The three broad domains of ISC's technology vision and the tabulation of current representative tasks in our Technology portfolio follow.

End-to-End System Autonomy - Enabling effortless science collection through autonomous mission systems.

VISION: Mission scientists operate, maintain and reconfigure systems from anywhere in order to optimize an onboard observation and maximize science return.

Advanced Scientific Analysis Tools and Data Systems - Enabling science knowledge discovery through seamless and transparent access to information Rapid.

VISION: Academic and research community has continuous and transparent access to data and information for scientific research.

Mission Formulation Design and Execution - Enabling revolutionary mission concepts through rapid mission formulation, implementation, and execution.

VISION: Mission scientists and engineers seamlessly evolve from science objectives into mission concepts through a virtual model to an operational science system.

Technology Program and Portfolio (Cont'd)

Project Name	End-to-End System Autonomy Goal, Objective, Function	Discipline	POC
Agents	Research intelligent agents and apply them in applications for mission operations autonomy.	Real-time Command and Control	Walt Truskowski/588
Common Planning and Scheduling System (ComPASS)	Develop, infuse, and transfer an advanced planning system for future missions to serve as an end-to-end (science-to-mission) integrated tool for scientists which handles science-goal driven distributed, autonomous onboard adaptive planning and scheduling.	Planning, Scheduling, and Command Management	Barbie Brown/588
HST Vision 2000 Health and Safety Data Mining Tool	Implement a data warehouse to be used by mission and instrument engineers for rapid queries of historical data for a specific area of interest as well as for discovering trends in the usage of instruments or spacecraft components.	Information & Knowledge Management	Ken Lehtonen/584
HST Vision 2000 Java Graphical User Interface	Develop a GUI to display, in real-time, engineering telemetry data that represents the health of the spacecraft at that moment interest as well as for discovering trends in the usage of instruments or spacecraft components.	Real-time Command and Control	Ken Lehtonen/584
Java-based Spacecraft Web Interface to Telemetry and Command Handling (JSWITCH)	JSWITCH is a platform-independent user interface to a spacecraft command and control system. Scientists have immediate access to instrument data subsets.	Real-time Command and Control	Code 583
LandSat7 Health & Safety monitoring with State Modeling	Provide advanced technology for flight operations team to monitor engineering telemetry using finite state models. This will enable early detection of anomalous conditions onboard the spacecraft and therefore reduce FOT monitoring time.	Real-time Command and Control	Julie Breed/588
MIDEX Advanced Ground System Technology	Reduce the cost of MIDEX mission operations by identifying and infusing technology, which will reduce costs by (1) automating routine FOT functions and (2) facilitating non-routine FOT functions.	Real-time Command and Control	Julie Breed/588

Technology Program and Portfolio (Cont'd)

Model Based Reasoning/ Advanced Multimodal Trend and Analysis System (AMTAS)	The goal of the AMTAS project is to automate and improve the process of spacecraft health and safety trend analysis.	Real-time Command and Control	Nigel Ziyad/588
NGST Adaptive Scheduler	Investigate generic onboard event driven science schedule execution and the expected state of flight software development methodologies in 2003.	Flight Software; Real-time Command and Control; Planning, Scheduling, and Command Management	Glen Cammarata/582
Spacecraft Artificial Intelligence Lab (SAIL)	Reduce Spacecraft Operations Costs and Support the Education of Midshipmen: - Leverage the Automated Satellite Command and Techniques by Hosting T&E on Space Assets.	Real-time Command and Control	Randy Seftas/588
Spacecraft Emergency Response System (SERS)/ Security Studies	Determine if it possible for a flight operations team to securely command a mission from home. If it is possible the study will then determine what is the best way for this type of operations to be achieved.	Real-time Command and Control	Susan Valett/588
Virtual Environment Testbed (VET)	Empower users to quickly understand the large amounts of data encountered when dealing with mission operations and science data analysis problems. This objective is to be accomplished through the development and application of data visualization technologies.	Real-time Command and Control	Matthew Brandt/588
Virtual Mission Operations Control (VMOC) & S/C Emergency Response System	The goal of the VMOC Project is to identify, develop, and infuse technology to enable mission control by on-call personnel in geographically dispersed locations.	Real-time Command and Control	Julie Breed/588

Technology Program and Portfolio (Cont'd)

Project Name	Advanced Scientific Tools & Data Sys Goal, Objective, Function	Discipline	POC
Invision	Develop and deliver data visualization products in support of science and engineering needs. Research advanced IS technology concepts in data visualization.	Information & Knowledge Management	Jeff Hosler/588
NGST Scientist's Expert Assistant (SEA)	Develop and infuse a tool to assist scientists in proposal specification for HST, in order to determine potential NGST capabilities, limitations, and implementations.	Information & Knowledge Management	Jeremy Jones/588
Science Mission Formulation Assistant	Develop an expert assistant to help engineers and scientists define mission concepts and designs starting with science / instrument concepts.	Mission Systems Engineering; Information & Knowledge Management	Karl Mueller/588

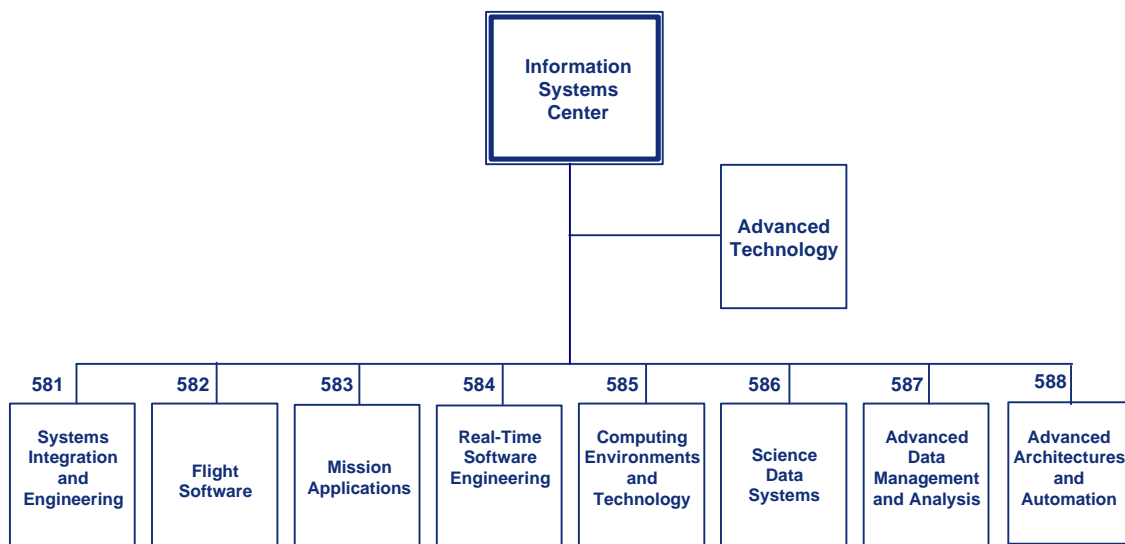
Project Name	Rapid Mission Formulation & Design Goal, Objective, Function	Discipline	POC
Advanced Engineering Services and Environments	Develop and support facilities to enable collaboration and facilitate progress during instrument and spacecraft concept development and design.	Mission Systems Engineering	Johnny Medina/588
Advanced Mission Formulation Support (AMFS)	Evaluate emerging technologies for applicability to new missions and identify how these technologies could affect operations.	Mission Systems Engineering	Steve Tompkins/581
Flight Software Initiatives Testbed	A facility that provides flight software test configurations to prototype, validate, and refine new approaches to solving flight software issues -- with the focus being towards faster, better, cheaper support to spacecraft developments.	Flight Software	Jane Marquart/582
Flight Table Maintenance Tool	A tool which permits FSW specialist to modify flight data in a common manner across all mission.	Flight Software	Code 582

Technology Program and Portfolio (Cont'd)

Future Architectures and Concepts for ISE	Provides systems analysis for the ISE architecture definition and planning. Focus is on mission design cycle time reductions, mission design cost reductions, system cost reductions, mission risk reductions, and risk/cost reduction for insertion of new technology.	Mission Systems Engineering	Ray Granata/585
Instrument Remote Control (IRC)	Develop, infuse, and transfer an advanced system for directly commanding remote instruments, and subscribing to data from remote instruments.	Flight Software; Real-time Command and Control	Troy Ames/588
Flight Software Reuse Library	The capability to promote flight software products to a controlled system in which coding standards, documentation and test data/results are enforced.	Flight Software	Stephen Leake/582
Operating Missions as Nodes on the Internet (OMNI)	Prototype and infuse a secure end-to-end system embodying the mission-as-a-node-on-the-Internet concept, using TDRSS for communications, which can be operated by a scientist via the Web.	Flight Software; Real-time Command and Control	James Rash/588
Simple Automated File Exchange (SAFE)	Develop, integrate, and transfer for deployment an application to provide automatic file replication in support of the 'spacecraft as a node' concept creating a 'virtual' spacecraft on the ground.	Flight Software; Real-time Command and Control	James Rash/588
Software Engineering Laboratory (SEL)	Study software engineering processes and product improvement within the Information Systems Center.	Software Engineering	Mike Stark/583
Space Object Technology Group (SOTG)	Develop framework for future space and ground architectures.	Software Engineering; Mission Systems Engineering	Gary Meyers/581

Branch Organization

To serve our customer's needs; the ISC implemented an organizational structure that reflects both the end-to-end scope and lifecycle phases of information systems, from program formulation through design/implementation/testing of flight and ground systems to distribution/archival/analysis of science data.



System Integration and Engineering (Code 581)

The System Integration and Engineering Branch provides expert advice and technical consultation to Principle Investigators and Mission Study Managers on operational concepts, data systems architectures and life-cycle costing. It provides end-to-end engineering of ISC mission systems development activities, including software development and flight operations. It provides expert consultation on software process improvements, technology assessments and product evaluations. The Branch provides on-orbit operations management (Mission Directors, etc.)

Management Team:

Branch Head

Margaret Caulfield
(301) 286-1048

Associate Branch Heads

John Leigh Gatto
(301) 286-4284

Howard Kea
(301) 286-5252

50 Employees

Major Customers:

- * Principal Investigators
- * Science Teams
- * STAAC Mission Study Managers
- * Project Managers

Core Capabilities:

- * Operational Concepts and Architecture Definition
- * Technology Assessment and Analysis
- * Software Engineering Consultation and Process Improvement
- * Data System Development and Management
- * Requirements Analysis and Tracking
- * Flight Operations Engineering and Management
- * Implementation Engineering
- * Mission and Timeline Planning
- * Ground System Implementation Management
- * Shuttle Operations and Data Management

Products/Services

- * Mission Operations Management
- * Standards Definition
- * Trade Studies
- * Ground System Development, Integration, and Test Systems
- * Software Engineering
- * Process Improvement Expertise and Consultation
- * ISO 9000 Expertise and Consultation

Key Accomplishments:

- * MIDE/EO-1 Combined Ground System Development & Operations Management
- * HST CCS Development and Operations Management
- * SMEX Ground System and Operations Management
- * ESDIS Development & Testing
- * SEL ISC Baseline Study Software Engineering Workshop (SEL)
- * Alternative Architecture Assessment

Additional Information:

For more information on our products and services, please take the opportunity to visit our web site at:
<http://isc.gsfc.nasa.gov/Organizations/581.htm>

Flight Software (Code 582)

The Flight Software Branch provides end-to-end life cycle products associated with embedded software for spacecraft, scientific instruments, and flight components.

Management Team:		
Branch Head	Associate Branch Heads	
Elaine Shell (301) 286-2628	Raymond Whitley (301) 286-6404	Lisa Shears (301) 286-2900
48 Employees		
Major Customers:		
* Project Managers		
* Science Teams		
* Principal Investigators		
* STAAC Mission Study Managers		
Core Capabilities:		
* Flight Software Systems Engineering		
* Flight Software Development		
* Flight Software Test and Validation		
Products/Services:		
* Spacecraft Flight Software		
* Science Instrument Flight Software		
* Attached Payload Software		
* Flight Component Software		
* Flight Software Dynamic Simulation Systems Technology Assessments and		
* Prototypes		
* Flight and Ground Trades		
* Flight Hardware Diagnostics		
* Smart Spacecraft and Science Instruments		
* Flight Software Systems Engineering		
* Hardware and Flight Software Integration Testing		
* Flight Software Independent Verification and Validation (IV&V)		
* Flight Software Sustaining Engineering		
* Flight Software Tools		
Key Accomplishments:		
* HST, SAMPEX, XTE, TRMM, FAST, SWAS, TRACE, WIRE, MAP FSW		
* EOS FSW Management		
* EOS FSW IV&V		
* XRS XDS, GLAS, MAP instrument FSW		
Additional Information:		
For more information on our products and services, please take the opportunity to visit our web site at:		
http://isc.gsfc.nasa.gov/Organizations/582.htm		

Mission Applications (Code 583)

The Mission Applications Branch provides for the development of off-line systems and applications to support Earth and Space Science missions. It develops operational mission data systems that include functions such as science and mission planning and scheduling aids guidance navigation and control software, and Network Control Center (NCC) Data systems.

Management Team:	
Branch Head	Associate Branch Head
Henry Murray (301) 286-6347	Scott Green (301) 286-5076
31 Employee	
Major Customers:	
* TRACE Project	
* WIRE Project	
* HST Project	
* NGST Project EOS AM-1 EO-1	
* Network Control Center	
* Image Science Operations Center	
Core Capabilities:	
* Command Memory Management Systems	
* Science Instrument Support Systems	
* Spacecraft and Mission Planning and Scheduling Systems	
* Mission Planning Aids System and Software Engineering	
* COTS Software Evaluation and Integration	
* Technology Assessment, Development and Infusion	
* Sustaining Engineering	
Products/Services:	
* Attitude and Orbit Determination Systems	
* Trajectory Determination Systems	
* Trend Analysis Systems	
* System and Software Engineering	
* Command Memory Management Systems	
* Science and Mission Planning Systems	
Key Accomplishments:	
* Integrated Commercial Products into Ground Systems (I.e., STK)	
* Supported LUNAR Prospector Mission	
* Completion of NCC 98 System	
Service Planning Segment Replacement (SPSR) System	
* Completion of WSC TCP/IP Data Interface Service Capability (WDISC)	
* Provided Mission Planning Support for the TRACE Mission	
Additional Information:	
For more information on our products and services, please take the opportunity to visit our web site at:	
http://isc.gsfc.nasa.gov/Organizations/583.htm	

Real-Time Software Engineering (Code 584)

The Real-time Software Engineering Branch develops ground data systems for integration and test and on-orbit operations of Earth and Space Sciences Missions.

Management Team:

Branch Head

Barbara Pfarr
(301) 286-5076

Associate Branch Heads

John Donohue (301) 286-6149	Jay Pittman (757) 824-1506
--------------------------------	-------------------------------

52 Employees

Major Customers:

- | | |
|----------------------------------|---------------------------------------|
| * SMEX Project | * Ultra-Long Duration Balloon Program |
| * Shuttle Small Payloads Project | * HST Project |
| * ESDIS Project | * Ground Networks Project |
| * EO-1 Project | * Wallops Test Range |
| * SPARTAN Project | * Wallops Range Safety Office |
| * MAP Project | |
| * NGST Project | |

Core Capabilities:

- * Planning for Future Missions
- * Software Engineering
- * Spacecraft Operations
- * Range Control Center & Tracking Station Systems Development
- * Technology Assessment and Analysis Technology Integration and Infusion
- * Project Management
- * System Development

Products/Services:

- * Command and Control Systems
- * Engineering Data Trend and Analysis Systems
- * Engineering Data Warehouse Systems
- * Engineering Data Simulators
- * Spacecraft Integration and Test Support Spacecraft Operations Support
- * Launch Support/Scheduling

Key Accomplishments:

- * Alternative Ground System for AM-1
- * TRACE, SWAS operational with ITOS
- * Automated Ground Station System for Norway, Alaska

Additional Information:

For more information on our products and services, please take the opportunity to visit our web site at:
<http://isc.gsfc.nasa.gov/Organizations/584.htm>

Computing Environments and Technology (Code 585)

The Computing Environments and Technology Branch provides general computing infrastructure support to the Information Systems Center, Flight Projects Directorate, Applied Engineering and Technology Directorate, Systems, Technology, and Advanced Concepts Directorate, and the Sciences Directorates.

Management Team:**Branch Head**

Howard Eiserike
(301) 286-7784

Associate Branch Head

Steve Naus
(301) 286-5640

39 Employees**Major Customers:**

- * AETD, STAAC
- * NMSP
- * IFMP
- * SD CD
- * ESDIS
- * SSDOO

Core Capabilities:

- * Infrastructure Application Development
- * Network Systems Engineering Expertise
- * Information Technology Management
- * Database Design and Development
- * Technology Assessment and Analysis
- * Computer System Architecture Support

Products/Services:

- * Web consultation, expertise, applications development, and forms
- * Communications/Network Engineering
- * COTS Assessments, Analysis, and Inventory Administration Tools
- * Science/Engineering Collaboration Support Tools

Key Accomplishments:

- * Development of Manpower Assessment Reporting System
- * ODIN implementation
- * GSFC Y2K COTS and NETBIOS Inventory

Additional Information:

For more information on our products and services, please take the opportunity to visit our web site at:
<http://isc.gsfc.nasa.gov/Organizations/585.htm>

Science Data Systems (Code 586)

The Science Data Systems Branch supports the Earth and Space Science communities by providing science data system development, consultation, and related technology assessment. The Branch develops systems for operational data capture level-0 and higher data processing, data archival, data product development, data distribution, and information management. The Branch utilizes new technologies, COTS/GOTS products, cost-saving strategies, and current design and development methodologies to provide studies, consulting, prototyping, design, development, verification, and sustaining engineering for its products.

Management Team:

Branch Head

Mary Ann Esfandiari
(301) 286-9776/2404

Associate Branch Head

Mary Reph
(301) 286-1006

42 Employees

Major Customers:

- * ESDIS Project
- * HST Project
- * Landsat-7 Project
- * TRMM Project
- * IMAGE Project
- * SMEX Project (TRACE & WIRE)
- * NSSDC
- * Lab for High Energy Astrophysics ESSP

Core Capabilities:

- * Software Project Planning and Management
- * Science Data Processing Systems (Level Zero and higher)
- * Science Database Systems
- * Science Data Product Generation System
- * Science Data Mass Storage/Data Warehousing/ Archive Systems
- * CCSDS Standards Consultation Technology Assessment and Planned Infusion
- * Science Data System Consultation
- * Smart Science Instruments Support

Products/Services:

- * Science Data Capture Systems and Level Zero Systems
- * Level 1 and higher Science Data Systems
- * Science Data Distribution Systems

Key Accomplishments:

- * Significant Support in the Development of EOSDIS
- * Landsat-7 Product Generation System (LPGS), Landsat-7 Image Assessment System (IAS)
- * Landsat-7 Product Development System (LPDS), Landsat-7 Processing System (LPS)
- * Landsat-7 DAAC Emergency System (DES)
- * MIDEX/IMAGE (LENA) Science Data Processing System
- * Workstation Based Level Zero Processing (DPS) for SMEX Missions

Additional Information:

For more information on our products and services, please take the opportunity to visit our web site at:
<http://isc.gsfc.nasa.gov/Organizations/586.htm>

Advanced Data Management and Analysis (Code 587)

The Advanced Data Management and Analysis Branch provides science data systems development, consultation, and advanced information technology support in the areas of algorithm development, data display and visualization, data mining, retrieval, fusion and dissemination, science data analysis programming, data archiving and mass storage. The current design and development methodologies provide systems engineering, system planning and consultation, prototyping, design, development, verification, and sustaining engineering for its products.

Management Team:**Acting Branch Head**

Mary Ann Esfandiari
(301) 286-9776/2404

Associate Branch Head

James Byrnes
(301) 286-3076

17 Employees**Major Customers:**

- * Earth Sciences Directorate
- * Space Sciences Directorate

Core Capabilities:

- * Software Project Planning and Management
- * Software Design and Development
- * Science Data Format Integration
- * COTS Product Integration
- * World Wide Web Data Analysis Applications

Products/Services:

- * Science Data Analysis Systems Development
- * Science Data Visualization Systems Development
- * Science Data Analysis Programming Support
- * Science Data Management, Mining, and Fusion
- * Web-based Data Analysis and Distribution
- * Algorithm Development Parallel Programming and Code Optimization
- * Technology Assessment and Analysis

Key Accomplishments:

- * Key Support for NEAR Gamma Ray Burst Timing Study
- * Completed Y2K and CDHF Reengineering Testing for the WIND/MFI Data Processing Systems
- * Delivered "Phase 1" flight computer software for the Unmanned Aerial Vehicle's (UAV) Topographic Mapper Instrument.

Additional Information:

For more information on our products and services, please take the opportunity to visit our web site at:
<http://isc.gsfc.nasa.gov/Organizations/587.htm>

Advanced Architectures and Automation (Code 588)

The Advanced Architectures and Automation Branch explores, develops and promotes state-of-the-art software and networking technologies critical for improving the effectiveness, and reducing the costs, of future generations of mission information systems. The Branch performs much of its work through collaborations with other NASA and government organizations, universities, and commercial partners. Branch personnel actively pursue the transfer and commercialization of technology.

Management Team:

Branch Head

Julie Breed
(301) 286-4342

Associate Branch Head

Barbara Medina
(301) 286-4438

30 Employees

Major Customers:

- * SOMO
- * SMEX
- * MDEX
- * STAAC
- * NGST
- * NCC
- * HAWC
- * SPIRE
- * SAFIRE
- * EAGAL
- * HESSI (UCB)
- * HST
- * TRIANA
- * CIPE
- * SEE

Products/Services:

- * GenSAA/GenIE
- * SERS
- * SAFE
- * SEA
- * ETC
- * VisAGE
- * IRC
- * VLSI Hardware
- * Software Engineering
- * Software Development
- * Technology Scanning & Assessment
- * Usability Engineering Center

Core Capabilities:

- * Information Systems Automation and Autonomy
- * Advanced Information Systems Architectures
- * Spacecraft and Science Instrument Modeling Tools
- * Science and Mission Proposal and Design Tools
- * Smart Spacecraft and Science Instruments
- * Engineering Data Trend and Analysis Technology
- * Control Center HCI Technologies
- * Software Consultation and Process Improvement
- * Technology Assessment Awareness

Key Accomplishments:

- * Demonstration of IP to Space feasibility
- * First operational implementation of rule-based AI for autonomous mission control
- * COTS GroupWare based emergency response system supporting 10 missions
- * Demonstration of advanced distributed agent concepts for mission control
- * On the forefront of development using JAVA technology (NGST SEA, IRC, VisAGE)

Additional Information: For more information on our products and services, please take the opportunity to visit our web site at: <http://isc.gsfc.nasa.gov/Organizations/588.htm>

Laboratories and Facilities

The ISC is dedicated to the implementation of end-to-end information systems in support of NASA programs and projects, specifically the GSFC Earth Science, Space Science, and Technology focus areas. In achieving this goal, the ISC with its partners, organizations and the science community, has established laboratories and facilities to support product implementation and technology research and assessment.

ISC resources include the latest information technologies that support the development of end-to-end systems to meet GSFC mission goals. These resources support ISC's vision in identifying and sponsoring new and emerging information systems technologies. The ISC Laboratories are listed below:

<u>Lab/Facility</u>	<u>Point of Contact</u>	<u>Purpose</u>
ACS FSW Dev Lab	J. Wilmot/582	Attitude Control System FSW Development
CSOC IPP H/W Lab	H. Eiserike/585	Sustaining H/W and S/W Support
DASDF	B. Rehm/582	FSW Support for HST
EOS-AM IVV FSTB	T. Clement/582	Verification, Validation & Post-Launch Maintenance of EOS-AM FSW
EOS-PM SDVF	T. Clement/582	Verification, Validation & Post-Launch Maintenance of EOS-PM FSW
ESTIF	B. Rehm/582	Development & Validation of HST Payload S/W
EUVE SDVF	M. Oben/582	FSW Change Testing, Investigation of S/C Anomalies, FOT Simulation for EUVE
FAST/SWAS SDVF	M. Oben/582	Provide H/W and S/W Simulators to Test FSW for SWAS and FAST
FSW Tech Init Dev Fac	R. Whitley/582	Develop, Integrate & Test FSW Tech Initiatives
GLAS FSW Dev Fac	R. Whitley/582	Develop, Integrate & Test GLAS Flight S/W
GRO Operational S/W H/W (GOSH) Lab	M. Oben/582	CGRO FSW Maintenance
Hitchhiker, Spartan, SMEX Grnd Station	B. Milner/584	Integration & Testing of experiments & GSEs, S/W Development for Ground Systems
IMDC Prototype Facility	J. Medina/588	Development, Integration & Testing of IMDC Specific Tools & Applications
ITOS Grnd S/W Facility	K. Calvert/584	Provide Support & Testing for SMEX Ground Systems
Real-time S/W Engineering Lab	B. Pfarr/584	Multi-purpose S/W Development Lab
Management Info. & Demo. Facility (MI&LDA)	B. Pfarr/584	Multi-purpose S/W Development Lab

Laboratories and Facilities (Cont'd)

MAP FSW Lab	J. Marquart/582	Develop FSW for MAP Mission
MADE Lab	H. Murray/583	Branch S/W Development and Training
MOCC Integration Lab	Ron Mahmot/584	Integration, Development and Testing of MOCC S/W
SAMPEX SDVF	D. Berry/582	Test FSW, Simulation, Investigate S/C Problems
Science Data Sys Lab	T. Southerland/586	To facilitate the assembly, integration, development, and test of science data systems before delivery. To identify technologies for enabling the management of science data, and develop products for processing, archiving, distributing, and visualizing.
Software Engineering Lab (SEL)	Howard Kea/581	Software Engineering Library
Small Computer Lab	J. Huppman/588	Testing and Deployment of New Technologies
Server Facility	B. Medina/588	UNIX, PC, LAN Server Facility
SMEX C&DH Dev Lab	M. Blau/582	Develop and Test C&DH FSW for all SMEX Missions
SMEX Dev Lab	J. Catena/581	Development Facility for SWAS, TRACE, & WIRE
Software Eng Lab	H. Kea/581	Software Engineering Library
System Support Fac	G. Meyers/581	Technology Enabling Resource
TDIF	B. Medina/588	S/W Technology Development, Testing & Demonstration
TRACE SDVF	M. Oben/582	Test FSW, Support FOT Usage of Simulator
TRMM STTF	M. Oben/582	Development and Validation of FSW, TRMM MOC Procedure Training
VLSI Sustaining Eng. Lab	B. Brown/588	Provides H/W and S/W Maintenance Support for VLSI Legacy Systems
WAVE Lab	J. Hosler/588	Exploration of Web Technology, Artificial Intelligence & Virtual Environments
WAVE Lab Hardware Facility	J. Hosler	Server Location
WFF Software Lab	J. Pittman/584	Information System Evaluation/Development/ Testing in Support of WFF Projects
WIRE SDVF	M. Oben/582	FSW Testing, Investigation of S/C Anomalies, FOT Simulation for WIRE
XTE SDVF	M. Oben/582	FSW Testing, Investigation of S/C Anomalies, FOT Simulation for XTE

Personnel Awards/Recognition's

Two ISC software product's development teams were awarded NASA Space Act Awards in 1999:

- Generic Inferential Executor (Genie)/588 - an expert system builder/runtime tool for automating S/C command and control functions (Team Lead was Pepper Hartley/710. Other GSFC contributors were Peter Hughes/580, Karl Mueller/588, and Greg Shirah/935)
- ITOS (Integrated Test and Operations System)/584 - a real-time control and monitoring system developed for control of spacecraft and spacecraft components during development, test, and on-orbit operations (Team Lead is Karen Keadle-Calvert/584)

The following were recipients of AETD and ISC Excellence Awards in 1999:

- Jane Marquart/582 received the prestigious AETD Engineering Excellence Award
- Jane Marquart/582 and Bob Schweiss/586 received ISC Engineering Excellence Awards
- Tracy Dorsey/584 contractor received the ISC Contractor Excellence Award

The following were recipients of ISC Best Technical Paper Awards in 1999:

- Keith Walyus/581, Dan Mandl/584, and Scott Green/583 received the Best Paper Award for their paper, "Lights-out Operations for the Transition Region and Corona Explorer using Operational and Architectural Approaches"
- David Simpson/582 received the Runner-up Best Paper Award for his paper, "An Alternative Lunar Ephemeris Model for Onboard Flight Software Use"

The following were recipients of GSFC Annual Honor Awards in 1999:

- Ray Whitley/582 received the prestigious Exceptional Service Medal
- Bob Sodano/581 received the Outstanding Leadership Medal
- Bob Sodano/581 accepted the Compton Gamma Ray Observatory (CGRO) Mission Team Group Achievement Award. Sharing in this commendation were: Peter Hughes/580, Bruce Love/582, Mike Oben/582, Alan Centa/584, Tom Marsh/584, Quinton Barker/585 and Kellyann Jeletic/585
- Bill Potter/584 accepted the Group Achievement Award for the AM-1 Alternative Architecture Mission Operations Center (AMOC) Team along with the following integral members: Joe Hennessy/580, Gary Alcott/581, Dave Campbell/581, Bob Dutilly/581, Bob Kozon/581, Mike Rackley/581, Leslye Boyce/582, Elizabeth Corderman/583, Tim Esposito/583, Linda Jun/583, Carla Matusow/583, John Watson/583 and Karen Keadle-Calvert/584
- Steve Naus/585 and the Microwave Anisotropy Probe (MAP) Simulation Team, including Dave McComas/582, received the "Best of the Best" Customer Service Excellence Award
- Mike Prior accepted WIRE civil servant Flight Operations Team Group Achievement Award

Personnel Awards/Recognition's (Cont'd)

The following were recipients of the GSFC Quarterly Honor Awards:

- Bob Sodano/581 received a Customer Service Excellence Award
- Earl Gernert/586 and Ben Keith/585 received Quality and Process Improvement Awards
- Bob Sodano/581, Earl Gernert/586 and Ted Southerland/586 shared in the Earth Radiation Budget Satellite (ERBS) Data Processing Recovery Team Award
- Bob Sodano/581 shared in the Earth Radiation Budget Satellite (ERBS) Battery Recovery Team Award
- Bob Schweiss/566 and his team received an Outstanding Teamwork Award for the Landsat-7 DAAC Emergency System (DES)
- Barbara Pfarr/584 and Leslye Boyce/582 won the Goddard Outstanding Management Awards
- Kecia Ford/580 and Linda White/501 - 580, received Goddard Institutional Support (Infrastructure) Awards
- Steve Naus was a recipient of the Quality and Process Improvement Award.

Troy Ames/588 and Carl Hostetter/588 and their industry partner AppNet, received the Internet Week's Business on the Internet award for the Most Innovative Site for their Instrument Remote Control (IRC) website. In addition, IRC's AIML was mentioned in a sidebar to the article "XML and the Second-Generation Web" in the May 1999 Scientific American.

Steve Naus received the "Best of the Best" Quality and Process Improvement Award on October 15, 1999 as part of the Goddard Quality Management Symposium.

Ben Keith of Code 585 was acknowledged at the Eighth Annual New Technology Reporting Event as a participant in their FY99 program. Ben contribution, "The Modularization and Generalization of a WWW Form Processing Tool", was exhibited at the NASA booth at the Eighth Annual New Technology show held in November 1998 in Boston MA.

Jeremy Jones/588, LaMont Ruley/583 and the NGST Scientist's Expert Assistant (SEA) team, had an illustration of the Visual Target Tuner (VTT) chosen as the cover image for the Proceedings of the Astronomical Data Analysis Software and Systems 98 Conference.

Margaret Caulfield/581 and Ken Lehtonen/584 were accepted into the 1999-2000 Fellows Program of the Council for Excellence in Government. The Council is a national non- profit organization whose mission is improving the performance of American government.

Mike Prior/584 was one of 2 GSFC Personnel accepted into the PDP Program and plans to spend one year at JSC gaining Manned-flight Mission Experience.

Jacqueline Mims/586 has received the "1999 Woman of Color Technological Excellence in Government Leadership Award." Ms. Mims was one of 32 women of color selected for top awards from more than 200 of the nation's top scientists, engineers, and technology leaders nominated.

The AM-1 Alternate Mission Operation Center (AMOC) won a NASA Group Achievement Award.

Publications

CONFERENCE PROCEEDINGS AND PUBLICATIONS:

(Many of these papers are available from the ISC Papers and Publications)

1999

- *Grand Challenge Problems in Real-time Mission Control Systems for NASA's 21st Century Missions* by Barbara Pfarr/584, John Donohue/584, and Peter Hughes/580. Presented at the 1st International Workshop of Real-time Mission Critical Systems: Grand Challenge Problems. Phoenix, AZ. November 1999.
- *The Relative Contributions of Stereo, Lighting and Background Scenes in Promoting 3D Depth Visualization* by Geoffrey Hubona, Philip Wheeler, Gregory Shirah/588 and Matthew Brandt/588. Published in the Transactions on Computer Human Interaction Journal. November 1999.
- *Culture Management on the NASA Hubble Space Telescope Control Center Reengineering Project* by Ken Lehtonen/584 and Larry Barrett/581. Presented at the 30th Annual Project Management Institute. Philadelphia, PA. October 1999.
- *Ensuring the Integrity of Possible Martian Life* by Mark Lupisella/584. Presented at the International Astronomical Federation Congress. Amsterdam, The Netherlands. October 1999.
- *Overview of the Wallops Flight Facility Mobile Range Control System* by Rodney Davis, Susan Semancik, Donna Smith, and Robert Stancil, Code 584. Presented at the 35th Annual International Telemetry Conference. Las Vegas, Nevada. October 1999.
- *SAFS: The Standard Autonomous File Server* by Susan Semancik/584. Presented at the International Astronomical Federation Congress. Amsterdam, The Netherlands. October 1999.
- *Managing the Software Development Process* by Amy Parra and Jeffrey Lubelczyk/586. Presented at the Astronomical Data Analysis Software and Systems (ADASS) IX Conference. Kona, Hawaii. October 1999.
- *The Role of Object Shadows in Promoting 3D Visualization* by Geoffrey Hubona, Philip Wheeler, Gregory Shirah/588 and Matthew Brandt/588. Published in the Transactions on Computer Human Interaction Journal. September 1999.
- *Information Technology Strategic Planning As A Tool for Enabling 21st Century Missions* by Peter Hughes/580 and Marti Szczur/580. Presented at the AIAA Space Technology Conference. Albuquerque, New Mexico. September 1999.
- *The Role of Metadata Standards in EOSDIS Data Search and Retrieval* by Robin Pfister/586. Presented at the International Geoscience and Remote Sensing Symposium '99. Hamburg, Germany. July 1999.
- *Agent Technology from a NASA Perspective* by Walter Truszkowski/588 and Harold Hallock/582. Presented at the Third International Workshop CIA-99 on Cooperative Information Agents. Uppsala, Sweden. July 1999.
- *Plug and Play Integration through Space Object Standardization* by Leslye Boyce/582, Gary Meyers/581, Emmett Rigsbee, William Branch, Jeffrey Shaw and David Poole. Presented at the International Conference on Information Systems Analysis Conference. Orlando, FL. July 1999.

Publications (Cont'd)

- *System Issues Related to Implementing in the Internet* by Dr. William Mackey, CSC Thomas C. Bagg III, TCB III Systems Analysis. Presented at the INCOSE, International Symposium, Brighton, England. June 1999.
- *Automated Attitude Sensor Calibration (ASCAL)* by Karl Mueller/588, Nigel Ziyad/588, Chariya Peterson and John Rowe. Presented at the NASA/Goddard Flight Mechanics Symposium. Greenbelt, MD. May 1999.
- *An Alternative Lunar Ephemeris Model for On-board Flight Software Use* by David Simpson/582. Presented at the NASA/Goddard Flight Mechanics Symposium. Greenbelt, MD. May 1999.
- *Adjustable Synchronization: A Proposal for Next Generation Space Telescope Operations* by Gary Welter, Jim Legg and Glenn Cammarata/582. Presented at the AAAI 1999 Spring Symposium Series-Agents with Adjustable Autonomy at Stanford University. Stanford, CA. March 1999.
- *Spacecraft Onboard Software Maintenance - An Effective Approach Which Reduces Costs and Increases Science Return* by Elaine Shell/582, Yvonne Lue and Martha Chu. Presented at the 3rd International Symposium on Reducing the Cost of Spacecraft Ground Systems and Operations. Tainan, Taiwan. March 1999.
- *The Spacecraft Emergency Response System (SERS) for Autonomous Mission Operations* by Julia Breed/588, Paul Baker, Kai-Dee Chu, Cynthia Starr/588, Mick Baitinger and Jeffrey Fox. Presented at the 3rd International Symposium on Reducing the Cost of Spacecraft Ground Systems and Operations. Tainan, Taiwan. March 1999.
- *Finding Coincident Data from Satellites: Using "Meta-Metadata" to Reduce Load on Archive* by Ted Willard and John Berbert/586. Presented at the IEEE/GSFC Mass Storage Conference. San Diego, CA. March 1999.
- *Web-Based Automated Reporting: Saving Time, Money, and Trees* by Jeffrey Fox, Cindy Starr/588, Paul Baker, Kai-Dee Chu, Julie Breed/588 and Mick Baitinger. Presented at the 2nd International Symposium on Spacecraft Ground Control and Data Systems. Foz de Iguacu, Brazil. February 1999.
- *An Object-Oriented Interface to CCSDS Ground Telecommand Services* by Tim Ray/584 and Jeff Condrón. Presented at the 2nd International Symposium on Spacecraft Ground Control and Data Systems. Foz de Iguacu, Brazil. February 1999.
- *Automated Flight Dynamics Product Generation for the EOS AM-1 Spacecraft* by Carla Matusow and Robert Wiegand, Code 583. Presented at the 2nd International Symposium on Spacecraft Ground Control and Data Systems. Foz de Iguacu, Brazil. February 1999.
- *Autonomous Command Operations of the WIRE Spacecraft* by Mike Prior/584, Keith Walyus/581 and Richard Saylor. Presented at the 2nd International Symposium on Spacecraft Ground Control and Data Systems. Foz de Iguacu, Brazil. February 1999.
- *JSWITCH/JSAT: Real-Time and Offline World Wide Web Interface* by Abigail Maury, Anna Critchfield and Jim Langston, Code 584. Presented at the 2nd International Symposium on Spacecraft Ground Control and Data Systems. Foz de Iguacu, Brazil. February 1999.

Publications (Cont'd)

- *User-Centered Design of Spacecraft Ground Data Systems at NASA's Goddard Space Flight Center* by Jeffrey Fox, Julie Breed/588, Karen Moe/588, Robin Pfister/586, Walter Truszkowski/588, Dana Uehling/588, Adriane Donkers and Elizabeth Murphy. Presented at the 2nd International Symposium on Spacecraft Ground Control and Data Systems. Foz de Iguacu, Brazil. February 1999.
- *Enabling High Performance Reconfigurable Ground Data Processing Systems* by Tonjua Hines/586 and Marco Figueiredo. Presented at the 2nd International Symposium on Spacecraft Ground Control and Data Systems. Foz de Iguacu, Brazil. February 1999.

1998

- *Improvements For Image Compression Using Adaptive Principal Component Extraction (APEX)* by Nigel Ziyad/588, E.T. Gilmore and M. F. Chouikha. Presented at the 32nd ASILOMAR Conference on Signal, Systems, and Computers. Pacific Grove, California. November 1998.
- *ISC Overview Paper for Software Engineering* by Howard Kea. Presented at the Software Engineering Workshop. GSFC, Greenbelt, MD, December 1998.
- *Incorporating Manual and Automatic Code Generation* by Dave McComas/581. Published in Embedded Systems Programming. September 1998. Dictionary Approaches To Image Compression And Reconstruction by Nigel Ziyad/588, E. T. Gilmore and M. F. Chouikha. Presented at the IASTED International Conference on Signal and Image Processing. Las Vegas, Nevada. October 1998.
- *A Fast Bit-Counting Algorithm* by Simon Berkovich, Gennadi M. Lapir and Marilyn Mack/585. Paper presented at ISIC/CIRA/ISAS'98. Gaithersburg, MD. September 1998.
- *Principal Component Extraction (APEX) for Image Compression* by Nigel A. Ziyad/588, Erwin T. Gilmore and Mohamed F. Chouikha. Presented at the ICSPAT Conference Proceedings. Toronto, Canada. September 1998.
- *Linear System Control Using Stochastic Learning Automation* by Nigel A. Ziyad/588 and Mohamed F. Chouikha. Presented at the IASTED International Conference on Control and Applications. Honolulu, Hawaii. August 1998.
- *Simple Automatic File Exchange (SAFE) to Support Low Cost Spacecraft Operation via the Internet* by James M. Repaci/588. Presented at the Conference on Satellite Networks: Architectures, Applications and Technologies. NASA Lewis Research Center. Cleveland Ohio. June 1998.
- *Software Change Management: Balancing Flexibility and Control* by Barbara Pfarr/584, Bradley Boyce, and Darlene West. Presented at the SpaceOps 98. Tokyo, Japan. June 1998.
- *A Photo Album of Earth: Scheduling Landsat 7 Mission Daily Activities* by Bill Potter/584, and John Gasch. Presented at the SpaceOps 98. Tokyo, Japan. June 1998.
- *Vision 2000: Radical Reengineering of the Hubble Space Telescope Control Center System* by Doug Spiegel/584 and Larry Barrett. Presented at the SpaceOps 98. Tokyo, Japan. June 1998.

Publications (Cont'd)

- *Lights-out Operations for the Transition Region and Corona Explorer using Operational and Architectural Approaches* by Keith Walyus/581, Dan Mandl/584 and Scott Green/583. Presented at the SpaceOps 98. Tokyo, Japan. June 1998.
- *Investigating Human/System Interfaces and Interactions in a "Lights-out" Operational Environment* by Walt Truszkowski/588, Elizabeth Murphy and Kent Norman. Presented at the SpaceOps 98. Tokyo, Japan. June 1998.
- *Facing the Reality of Operating with Minimal TDRSS Support* by Angie Kelly/581. Presented at the SpaceOps 98. Tokyo, Japan. June 1998.
- *GOES I-M On-Orbit Storage Mode and Operations Plan* by Doug McCuistion/580, Edwin Harvie, Dr. Milton Phennegar, and John Fiorello, Jr. Presented at the SpaceOps 98. Tokyo, Japan. June 1998.
- *A Fast Bit-Counting Algorithm* by Simon Berkovich, Gennadi M. Lapir and Marilyn Mack/585. Poster presented at the Second Annual Briefing to Industry, George Washington University, Gaithersburg Campus, VA Campus Tech Expo Poster Session. Gaithersburg, MD. April 1998.
- *Applications of Data Warehousing and Mining* by Ken Lehtonen/584. Presented at the Special Executive Conference. Santa Barbara, CA. April 1998.
- *An Expert Assistant System to Support the General Observer Program for NGST* by Tom Brooks, Lisa Dallas/588, Sandy Grosvenor, Jeremy Jones/588, Anuradha Koratkar and LaMont Ruley/583. Paper and poster presentation at the SPIE '98 Symposium on Astronomical Telescopes and Instrumentation. Kona, Hawaii. March 1998.
- *Visualization Tools to Support Proposal Submission* by Tom Brooks, Lisa Dallas/588, Sandy Grosvenor, Jeremy Jones/588, Anuradha Koratkar and LaMont Ruley. Paper and poster presentation at the SPIE '98 Symposium on Astronomical Telescopes and Instrumentation. Kona, Hawaii. March 1998.
- *Trend Analysis for Spacecraft Systems Using Multimodal Reasoning* by Charisse Sary, Chariya Peterson, John Rowe, Troy Ames/588, Karl Mueller/588, Walt Truszkowski/588 and Nigel A. Ziyad/588. Technical Report presented at the AAAI Symposium on Multimodal Reasoning. Menlo Park, CA. March 1998.
- *Organization of Near Matching in Bit Attribute Matrix Applied to Associative Access Methods in Information Retrieval* by Simon Berkovich, Eyas El-Qawasmeh, Gennadi M. Lapir, Marilyn Mack/585 and Christopher Zincke. Paper presented at the Sixteenth IASTED International Conference Applied Informatics; Garmisch-Partenkirchen, Germany. February 1998.
- *Automating the Compton Gamma Ray Observatory Ground System: Expert System and WWW Technologies* by Dave McLean/588, Yi Zhang and M. Fatig. Proceedings of the World Congress on Expert Systems. Mexico City, Mexico. January 1998.
- *Goddard's New Approach to Information Technology - An Overview of the Information Systems Center* by Howard Kea/581. Presented at the 23rd NASA Annual Software Engineering Workshop. December 1998.

Publications (Cont'd)

WHITE PAPERS:

- *NGST Autonomy: A Comprehensive Analysis of Possible Onboard Autonomy for the NSGT Mission* by Lou Hallock/Code 582. October 1998
- *Performance Based Contracting: A Technical View* by Johnny Medina/588. August 1998.
- *A Web-Based Emergency Response (ERS) for Lights Out Operations* by Jeffrey Fox, Julie Breed/588, Paul Baker and Mick Baitinger. June 1998.
- *Investing Human Performance Issues in Lights Out Ground Operations* by Walt Truszkowski/588 and Elizabeth Murphy. June 1998.
- *The Effects of Motion and Stereopsis on Three-Dimensional Visualization* by G.S. Hubona, Greg W. Shirah and D. Fout/588. June 1998. SEA Design Document by Sandy Grosvenor, Jeremy Jones/588 and Tom Brooks. February 1998.

Contractor Partners

To meet our customer's needs, ISC partners with the following contractors:

Contractor Partners

Supports Codes

AlliedSignal Technical Services Corp. → http://www.honeywell.com/	580 - 588, inclusive
Altair Aerospace Corporation → http://www.altaira.com/	588
Analytical Graphics → http://www.stk.com/	582
ASRC Aerospace → http://www.akspace.com/	582
August Automation, Inc. → http://www.august-automation.com/	582
Booz, Allen and Hamilton, Inc. → http://bah.com	588
AppNet, Inc. → http://appnet.com/	584, 585, 588
Computer Sciences Corporation → http://www.csc.com/solutions/	582, 584, 586, 587, 580 - 588
Global Science & Technology → http://www.gst.com/	588
The Hammers Company, Inc. → http://www.hammers.com/	582, 584, 585
Lockheed Martin Space Operations, Corp. → http://www.lmco.com/	580 - 588, inclusive
NEXGEN Solutions, Inc. → http://www.blem.ac.cn	588
Omitron, Inc. → http://omitron.com/	580 - 588, inclusive
Orbital Sciences → http://orbital.com	582
Pacific Northwest National Laboratory → http://pnl.gov/	586, 588
QSS Group, Inc. → http://www.qssgroupinc.com/index.html	580 - 588, inclusive
Raytheon ITSS → http://www.raytheon.com/	581 - 588, inclusive
Intellisource Information Systems → http://www.Intellisource.com/	580 - 588, inclusive
System and Software Designers Inc.	582
SGT → http://www.sgt-inc.com/	584
Unisys Corporation → http://unisys.com/	585

Collaborations with Universities and Research Laboratories

It is critical for an advanced information systems group to be able to efficiently infuse new approaches and software components into operational systems and to stay abreast of current worldwide research activities. An effective method to fulfill this information requirement is to develop relationships and collaborative activities with other Centers, government laboratories and universities. The following list highlights the active research projects and university collaborations during the past year:

Virtual Mission Operations Center Project

Description: The VMOC is a testbed for demonstrating and evaluating new operations concepts, new technologies, and COTS software to enable distributed mission control.

Government Laboratory: Pacific Northwest National Laboratories Department of Energy

Researcher: Jeffrey Fox

GSFC Colleague: Julie Breed

Advanced Search Mechanisms

Description: This work addresses research into the use of dynamic queries and other advanced search mechanisms for very large databases. The customer for this work is the EOSDIS project.

University: University of Maryland

Researcher: Dr. Catherine Plaisant

GSFC Colleague: Chris Rouff

Formal Specification of AGENT Systems

Description: This effort focuses on formally specifying and verifying the agent system being developed in Code 588.

University: University of Nebraska at Omaha

Researcher: Dr. Mike Hinchey

GSFC Colleague: Chris Rouff

AGENT-Based Information Processing System

Description: This effort is concentrating on developing a user interface community of agents that act as an interface to autonomous systems. The emphasis is currently on natural language dialog handling.

University: Bowie State University

Researchers: Drs. Sadanand Srivastava & James Gill de Lamadrid

GSFC Colleague: Walt Truskowski

Collaborations with Universities and Research Laboratories (Cont'd)

Planning/Scheduling for AGENTS

Description: This James Madison work is contributing to the development of newer approaches to learning for use in the new agent architecture being developed by the Goddard Agent Group.

University: James Madison University

Researcher: Dr. James Pomykalski

GSFC Colleague: Walt Truszkowski

Science Mission Assistant and Research Tool

Description: The goal of SMART is to develop an interactive, web-based tool suite which will assist scientists and mission teams in specifying high-level science objectives for a science initiative, and defining how those objectives can be met.

Government Laboratory: Naval Research Laboratory Department of the Navy

Researcher: Dr. David Aha

GSFC Colleague: Walt Moleski

Modeling Techniques

Description: The effort addresses the development of a standard software design methodology for multi-agent systems.

University: UMBC

Researcher: Dr. Victoria Yoon

GSFC Colleague: Walt Truszkowski

Multi-AGENT System Development

Description: This team is investigating the modeling techniques that will be used in a new agent architecture that is being developed by the Goddard Agent Group.

NASA Center: Johnson Space Center

Researcher: Michael van Chau & Dr. Kutluhan Erol

GSFC Colleague: Walt Truszkowski

Collaborations with Universities and Research Laboratories (Cont'd)

Formal Foundations of AGENT Technologies

Description: This research is about the formal foundations of agents, including logical analysis of agent behaviors, modeling of agent communities in action - with such formalisms as colored Petri Nets, the Pi Calculus, and other topics.

University: North Carolina A&T

Researcher: Dr. Albert Esterline

GSFC Colleague: Walt Truskowski

Spacecraft Operations & Automation Research Facility

Description: This effort is a combined USNA/GSFC project to research and develop advanced automation techniques for ground station and spacecraft operations. This project will upgrade and utilize the 12-meter ground station located on the Naval Academy grounds.

University: United States Naval Academy

Researcher: Lt. Col. B.R. Smith

GSFC Colleague: Leigh Gatto

Instrument Remote Control

Description: The IRC project is defining an adaptive framework from the science user to the instrument that will provide robust interactive and distributed controls and monitoring of remote instruments.

Research Association: Center for Astrophysical Research in Antarctica (CARA) who's members include Boston, Carnegie Mellon, and Northwestern Universities; Smithsonian Center for Astrophysics; and the University of Chicago

Researcher: Dr. Al Harper & Dr. Robert Loewenstein

Research Association: Universities Space Research Association (USRA)

Researcher: Dr. Sean Casey

GSFC Colleague: Troy Ames

IMAGE 2000

Description: Invision is working with CIPE and SEE to develop a Java2-based Image Processing software for use in the educational, science and medical communities. The implementation of the software will use Java Advanced Imaging API in collaboration with Sun Microsystems, Inc.

Research Associations: Center for Image Processing in Education (CIPE), Scientific and Education Endeavors (SEE), and Sun Microsystems, Inc.

Researcher: Melanie Magisos, Blanche Meeson, Paula Patel

GSFC Colleague: Jeff Hosler

Collaborations with Universities and Research Laboratories (Cont'd)

Science Data Cycle

Description: This research defines an architecture for the end-to-end operation for an astronomical facility from observation planning to science data capture, data archiving, science discovery, and publication.

University: Rochester Institute of Technology

Researcher: Dr. Ian Gatley & Dr. Harvey Rhody

Research Association: Universities Space Research Association (USRA)

Researcher: Dr. Sean Casey

GSFC Colleague: Troy Ames

Knowledge Acquisition Processes for Software Engineering Baseline and Planning

Description: his research is to develop a process for assessing and updating the knowledge acquisition processes used to develop baselines and profiles. It draws upon insights from the Goddard Software Engineering Laboratory and ISC's Software Engineering Focus Group. The initial research results led to a NASA \$100,000 Partnership Award for Innovative and Unique Education and Research Projects.

University: Howard University

Researcher: Dr. John Trimble

GSFC Colleague: Walt Truskowski/588 and Howard Kea/581

Management Point-of-Contacts

Chief

Associate Chief	Martha R. Szczur	(301) 286-8623
Associate Chief	Joseph F. Hennessy	(301) 286-6663
Assistant Chief for Technology	James (Doug) McCuiston	(301) 286-6663
Infrastructure Support Manager	Peter M. Hughes	(301) 286-3120
Senior Staff Engineer	Dennis M. Giblin	(301) 286-6127
	Vicki L. Oxenham	(301) 286-7203

581 Systems Integration and Engineering Branch

Branch Head	Margaret I. Caulfield	(301) 286-1048
Associate Branch Head	Howard E. Kea	(301) 286-5252
Associate Branch Head	John R. Leigh Gatto	(301) 286-4284

582 Flight Software Branch

Head	Elaine M. Shell	(301) 286-2628
Associate Branch Head	Raymond Whitley	(301) 286-6404
Associate Branch Head	Lisa B. Shears	(301) 286-2900

583 Mission Applications Branch

Head	Henry L. Murray	(301) 286-6347
Associate Branch Head	Scott E. Green	(301) 286-5076

584 Real-time Software Engineering Branch

Head	Barbara B Pfarr	(301) 286-2058
Associate Branch Head	Thomas (Jay) Pittman	(757) 824-1506
Associate Branch Head	John T. Donohue	(301) 286-6149

585 Computing Environments and Technology Branch

Head	Howard M. Eiserike	(301) 286-7784
Associate Branch Head	Steve A. Naus	(301) 286-5640

586 Science Data Systems Branch

Head	Mary Ann Esfandiari	(301) 286-9776
Associate Branch Head	Mary G. Reph	(301) 286-1006

587 Advanced Data Management and Analysis Branch

Acting Head	Mary Ann Esfandiari	(301) 286-9776
Associate Branch Head	James B. Byrnes	(301) 286-3076

588 Advanced Architectures and Automation Branch

Head	Julia D. Breed	(301) 286-4342
Associate Branch Head	Barbara B. Medina	(301) 286-4438

Products/Services - Point-of-Contacts

Advanced IS Architectures	Johnny Medina/581
Assist. MSM-SOMO	Bruce Thoman/581
Attached Payload FSW	Elaine M. Shell/582
Command and Control Systems	Barbara Pfarr/584
Command Memory Management Systems	Henry Murray/583
Communications/Network Engineering	Howard Eiserike/585
COTS/GOTS Product Assessments & Analysis	Gary Meyers/581
End-to-end Data Systems and Test Validation Engineering	Mary Ann Esfandiari/586
Engineering Data Simulators	Barbara Pfarr/584
Engineering Data Warehouse Systems	Barbara Pfarr/584
Flight and Ground Trades	Elaine M. Shell/582
Flight Component FSW	Elaine M. Shell/582
FSW IV&V	Tom Clement/582
FSW Simulators & High Fidelity Dynamic Testbeds	Elaine M. Shell/582
FSW Sustaining Engineering	Elaine M. Shell/582
FSW Systems Engineering	Elaine M. Shell/582
Internet/Web Applications Development	Steve A. Naus/585
Launch Support/Scheduling/Wind Weighing (WFF)	Barbara Pfarr/584
Lead Flight Engineers (Mission Directors)	Robert Sodano/581
Mass Storage Systems Support	Howard Eiserike/585
Mission Automation and Autonomy	Barbara B. Medina/588
Mission Operations Attitude and Orbit Determination Systems	Scott Green/583
Mission Planning Aids	Scott Green/583
Operations Concepts and Architecture Definition	Steve Tompkins/581
Outreach (Education, Partnerships ...)	Vicki L. Oxenham/580
Parallel Programming and Code Optimization	Mary Ann Esfandiari/587
Planning for Future Missions	Steve Tompkins/581
Range, Control Ctr & Tracking Station Sys Development (WFF)	Barbara Pfarr/584
S/C and Mission Planning & Scheduling Systems	Henry Murray/583
S/C and Science Instrument FSW Reuse Engineering	Elaine M. Shell/582
S/C Integration & Test Support	Barbara Pfarr/584
Science and Mission Proposal & Design Tools	Johnny Medina/581
Science Data Analysis Systems (Algorithm Development & Programming Support)	Mary Ann Esfandiari/587
Science Data Distribution Systems	Mary Ann Esfandiari/586
Science Data Mass Storage/Data Warehousing/Archive Systems	Mary Ann Esfandiari/586
Science Data Processing Systems (Level 1 & Higher)	Mary Ann Esfandiari/586
Science Data Product Generation Systems	Mary Ann Esfandiari/586
Science Data Visualization Systems (Science Image Processing)	Mary Ann Esfandiari/586
Science Instrument Support Systems	Henry Murray/583
Science/Engineering Collaboration Support Tools	Howard Eiserike/585
Smart S/C and Science Instruments	Elaine M. Shell/582
Software Engineering	Howard Kea/581
Strategic Technology Planning and Management	Peter Hughes/580
Systems Engineering	Margaret I. Caulfield/581
Web Administration Tools	Ben Keith/585

Acronyms and Abbreviations

ACE	Advanced Composition Explorer
ACS	Attitude Control System
ADASS	Astronomical Data Analysis Software and Systems
ADEOS	Advanced Earth Observing Satellite
AESE	Advanced Engineering Services & Environments
AMOC	Architecture Mission Operations Center
APEX	Adaptive Principal Component Extraction
ASCAL	Automated Attitude Sensor Calibration
ATS	Automated Tracking Station
Avatar	Advanced Visual Tools and Architectures
CGRO	Compton Gamma Ray Observatory
CCS	Control Center Systems
CCSDS	Consultative Committee for Space Data Systems
C&DH	Command and Data Handling
CIPE	Center for Image Processing in Education
ComPASS	Common Planning and Scheduling System
COTS	Commercial off -the Shelf
CSOC	Consolidated Space Operations Contract
DES	Landsat-7 DAAC Emergency System
EOS	Earth Observing System
EODIS	Earth Observing System Data Information System
ERBS	Earth Radiation Budget Satellite
EO-1	Earth Observing-1
EPGN	EOS Polar Ground Network
EUVE	Extreme Ultraviolet Explorer
FAST	Fast Auroral Snapshot Explorer
FDS	Flight Dynamics Support System
FUSE	Far Ultraviolet Spectroscopic Explorer
GenSAA	Generic Spacecraft Analyst Assistant
GenIE	Generic Inferential Executor
GOSH	GRO Operational S/W H/W
GOTS	Government-Off-The-Shelf
GRO	Gamma Ray Observatory
GSFC	Goddard Space Flight Center
GUI	Graphical User Interface
HAWC	High-resolution Airborne Wideband Camera
HCI	Human Computer Interface
HCU	Hitchhiker Central Unit
HESSI	High Energy Solar Spectroscopic Imager
HPCC	High-Performance Computing and Communications
HST	Hubble Space Telescope
IAS	Landsat-7 Image Assessment System
IFMP	Integrated Financial Management Program
IMAGE	Imager for Magnetosphere-to-Aurora Global Explorer
IMDC	Integrated Mission Design Center
IMP	Interplanetary Monitoring Platform
IPIC	IP Instrument Control
IRC	Instrument Remote Control
ISC	Information Systems Center
ISTP	International Solar-Terrestrial Physics
ITOS	Integrated Test and Operations System

JRTADS	Java Real-time Attitude Determination System
JSWITCH	Java-based S/C Web Interface to Telemetry and Command Handling
LZAARDS	L0 Active Archive Retrieval and Distribution System
LENA	Low Energy Neutral Atom
LPGS	Landsat-7 Product Generation System
LPDS	Landsat-7 Product Development System
LPS	Landsat-7 Processing System
MADE	Mission Applications Development Environment Lab
MAP	Microwave Anisotropy Probe
MARS	Manpower Assessment Reporting System
MIDEX	Medium-class Explorers MOC Mission Operations Center
NASA	National Aeronautical and Space Administration
NCC	Network Control Center
NCCS	National Space Science Data Center
NGST	Next Generation Space Telescope
NOAA	National Oceanic and Atmospheric Administration
NSSDC	National Space Science Data Center
OMNI	Operating Missions as Nodes on the Internet
POCC	Payload Operations Control Center
SAFE	Simple Automated File Exchange
SAFS	Standard Autonomous File Server
SAFIRE	Submillimeter And Far Infrared Experiment
SAIL	Spacecraft Artificial Intelligence Lab
SAMPAX	Solar, Anomalous and Magnetosphere Particle Explorer
SAS	Service Accounting System
SASM	System Administration and Security Management
SDCD	Space Data and Computing Division
SEA	Scientist's Expert Assistant
SEE	Space Environments and Effects
SEL	Software Engineering Laboratory
SERCE	Spacecraft Emergency Response Collaborative Environment
SERS	Spacecraft Emergency Response System
SIRTF	Space Infrared Telescope Facility
SM	Servicing Mission
SMEX	Small Explorers
SN	Space Network
SOFIA	Stratospheric Observatory For Infrared Astronomy
SOHO	Solar Heliospheric
SOMO	NASA Space Operations Management Office
SOTG	Space Object Technology Group
SPIRAC	South Pole Infrared Array Camera
SPIREX	South Pole Infrared Explorer
SPSR	Service Planning Segment Replacement
SSDOO	Space Science Data Operations Office
STAAC	Systems, Technology, and Advanced Concepts
SWAS	Submillimeter Wave Astronomy Satellite
TDIF	Technology Demonstration and Infusion Facility
TRACE	Transition Region and Coronal Explorer
TRMM	Tropical Rainfall Measuring Mission
UAV	Unmanned Aerial Vehicle's
ULDB	Ultra Long Duration Balloon
UNEP	United Nations Environmental Program
VET	Virtual Environment Testbed
VisAGE	Visual Analysis Graphical Environment

VLSI	Very Large Scale Integration
VMOC	Virtual Mission Operations Control
VTT	Visual Target Tuner WFF Wallop Flight Facility
WICC	Wallops Integrated Control Center
WIRE	Wide-Field Infrared Explorer
WSC	White Sands Complex
WWW	World Wide Web
XRS	X-Ray Spectrometer
XTE	X-Ray Timing Explorer
